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REPORT OF STANISLAUS-TUOLUMNE NIRA INSECT CONTROL PROJECT STANISLAUS NATIONAL FOREST CALIFORNIA

By

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BERKELEY, CALIFORNIA

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REPORT OF STANISLAUS-TUOLUMNE NIRA INSECT CONTROL PROJECT STANISLAUS NATIONAL FOREST CALIFORNIA

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FOREWORD

This control project was possible through an allotment of NIRA funds made available in October, 1933. Tentative plans for its prosecution were developed at a conference of representatives of the Forest Service, Park Service, and of the Bureau of Entomology, held in Yosemite Park on September 7, 1933. Prior to this date, during the summer of 1933, preliminary surveys of the project area, and of adjoining forested lands, had been completed by spotting crews working under ECW assignments. The results of these surveys showed that the insect infestation on the area was verging on an epidemic condition and that current losses were in amount sufficient to warrant control measures.

Previous annual losses on the area for the years 1931 and 1932 approximated 6.000 MBM and 13.500 MBM respectively. The current beetle losses in October, 1933, was estimated at 3.000 MBM, or approximately 115 board feet per acre.

THE PROJECT AREA

The Area:

The control area comprises about 27,000 acres in township 1 south, ranges 18 and 19 east, in the Tuolumne District of the Stanislaus National Forest. It is situated between the Tuolumne Canyon on the north and the Scott and Crocker ridges to the south. The former constituting the northern boundary and the latter the southern limits. Adjoining infested areas are the privately owned lands east of the Mather Road and south to Crocker Ridge; and contiguous Yosemite Park lands beyond these. The Buck Meadows CCC control area adjoins the project area on the west and southwest. Control operations carried out on these adjoining infested areas will be reported in separate reports. Exact location of these areas is shown on the attached map.

Control Work on Adjacent Areas:

Control work on the Buck Meadows area was carried out by ECW supervision and CCC enlisted labor. An agreement with the National Park Service provided for the control of the cooperative area adjoining the project on the east.

This cooperative area is sandwiched between the project and other control areas within the Park and which were concurrently worked by the Park Service. The acreage amounts to approximately 9,600 acres. With the exception of 2,500 acres in the extreme northern part, it is under private ownership. Since this infestation was a menace to the Government areas on both sides of it, provision was made for its removal. The cooperative agreement for this purpose provided that the control work be

done by the National Park Service and the Forest Service pay the cost on a per treated tree basis. A sum of $6,000.00 was set up by the Forest Service and allotted to the Yosemite Park to pay the cost of this operation. The boundaries of the area as originally agreed upon was the Park line on the north and east, and the Mather and Big Oak Flat roads on the west and south. Later, for administrative reasons, these boundaries were partially revised as a result of trading between the two agencies; the Park Service assuming control of that part lying south of the Big Oak Flat Road east of sections 34 and 4, and the Forest Service taking over, in lieu of that area, sections 2, 11, 13 and 14, in the northern limits.

It should be emphasized here that the infestation on both the Forest Service and Park Service projects, as well as on the cooperative area, was continuous and entomologically was, of necessity, considered as a single infestation unit. Subdividing it into separate, workable projects was done for reasons of administrative authority and ownership. Control operations were carried out concurrently by both services. The Foreman of Insect Control acted as technical adviser to both services in the control of these related projects.

Timber Types:

The main timber species within the area are ponderosa pine and sugar pine, usually mixed, and associated with white fir, Douglas fire, and incense cedar.

Ponderosa pine occupies the greater part of the area in an extensive pure type, with oak and incense cedar, scattering Douglas firs and greater numbers of sugar pine.

Most of the area is Site 2. The timber on the whole is of excellent quality but mature and over-mature trees in the larger diameter classes make up by far the greatest volume of growing stock.

Approximately 1,200 acres in the extreme northeastern part have been logged though still supporting some infestation.

Ownership:

The ownership of the lands included within the project area is 75% Federal and 25% privately owned. The Forest Service owning 20,360 acres of the total 27,000 acres, and 6,640 being under private ownership.

BEETLE INFESTATION - FALL OF 1933

Character and Status:

The character of the infestation in the fall of 1933, while aggressive, was in a subsiding epidemic state. This trend may be

described in average annual loss per section for the whole area thusly:

1931 . . . . . 67 trees

1932 . . . . . 164 trees

1933 . . . . . 115 trees

The overwintering infestation in November, when control work was started, amounted to an average of about 50 infested trees per section.

Insects Involved:

Insects responsible for these losses are the western pine beetle (Dendroctonus brevicomis) in ponderosa pine, the mountain pine beetle (Dendroctonus monticolae) in sugar pine and less frequently in ponderosa pine; the flathead beetle (Melanophila gentilis) and two species of Ips, (Ips emarginatus and Ips confusus).

CONTROL WORK

Beginning of Operations:

Actual control work (spotting, felling, and burning infested trees) was delayed until the fall rains had greatly eliminated fire hazard. The first rain of the season began October 29 and continued until November 1. Several days prior to this storm the survey crew of three men was engaged in trucking lumber and equipment to the camp sites. Four carpenters were employed on tent platforms, etc. This work of getting the camps established was continued until November 6 when appointment of the spotters became effective and these men were then started marking infested trees. During the succeeding week the man power of the two control camps was increased to full strength and control operations were under way in both camp areas.

Camps:

For the conduct of the fall control operations two camps were established. Camp One, Berkeley, was established in the City of Berkeley Tuolumne Camp at Harden Flat. Camp Two, Diamond "O", was established in the Oakland Boy-Scout Camp near Mather. Later, during the spring control operations in 1934, Camp One, Berkeley, was moved to the City of Oakland recreation camp at South Fork. Diamond "O" was re-occupied by Camp Two during this spring period. These camps were occupied under lease from the owners; the City of Berkeley, and the City of Oakland, respectively. The kitchens and mess halls of the Berkeley and Oakland camps were utilized. Sleeping quarters at these camps were provided by erecting tents on platforms. Both mess and sleeping quarters were provided by several buildings at the Diamond "O" Camp. Tents at this camp were not necessary. These camps were especially convenient and their location ideal in reference to accessibility of the project area.

Organization:

Each camp was organized as a complete unit with full personnel, equipment and transportation. The personnel of each consisted of 32 men assigned as follows:

1	Camp Foreman
1	Spotter Foreman
3	Spotters
14	Fallers
7	Peelers
1	Cook
1	Flunky
1	Sawfiler
1	Truck Driver (also Peeler)
1	Bull Cook
1	Smoke Chaser (used only during the spring operations when fire hazard was extremely high)

Equipment consisted of:

1	Pickup truck for Camp Foreman
1	Pickup truck for Spotting Crew
1	Stake body. 1½ ton truck for transporting treating crews to field and back, and for hauling provisions.
	Tools (saws, axes, sledges, wedges, shovels, etc.)
	Mess equipment, tents, cots and mattresses.

Supervision:

The Foreman of Insect Control was directly charged with the supervision of the project. He was ably assisted by the two Camp Foremen, Messrs. B. L. Parsons and Vance L. Brown. The former in charge of Camp Two and the latter of Camp One. The duties of the camp foremen consisted of administration of camps, supplying camps with the necessary provisions, etc., assignment of treating crews, cost accounting and payrolls.

The two Spotter Foremen, W. A. Meckel, assigned to Camp One, and L. E. Barnes, assigned to Camp Two, were charged with the supervision of the Spotting Crews with which they worked. Additional duties consisted of compilation of field data, making maps for treating crews and weekly summaries of work accomplished.

Assignment of Men:

The spotting crews consisted of four men each - one compassman and three spotters. It was found that a crew of this size functioned more efficiently than a three man crew; the increased production exceeding by more than 25% that of the smaller crew. Strips ten chains in width were spotted in each traverse across a section. One spotting crew was able to keep well ahead of the treating crews in

each camp operation.

The treating crews were composed of two fallers and one swamper each. There were seven of these crews in each camp. During the time the fallers were engaged in falling the tree, the swamper constructed the fire line surrounding its future bed. The entire crew limbed and peeled the tree and later fired it. During the spring period of work, it was necessary for the swamper to remain with the burning tree until it was well burned and safe to leave. Also, during this period, a "smoke chaser" was employed in each camp to follow up the burning by examining each treated tree, and when necessary, putting out fires in "catfaces," breaks and stumps, thereby preventing hang-overs hazard. These precautionary measures were usually accomplished by shoveling mineral soil on the burning parts. However, those men were equipped with back pumps which were used when occasion demanded.

Wages:

Wages of the men employed on this project were based on the WPA scale. The rate was greatly in excess of that of previous insect control projects which is directly apparent in the unit cost of the trees treated.

The positions of foremen, spotters, sawfilers and cooks were classified as skilled, and it was necessary for the men filling these positions to qualify under civil service requirements. The various rates paid were:

Camp Foreman	$2,600. per year
Spotter Foreman	$2,600. per year
Fallers	75 cts. per hr.
Cooks	$1.10 per hr.
Sawfiler	$1.10 per hr.
Straw boss	75 cts. per hr.
All other labor	55 cts. per hr.

The men were required to do 8 hours productive work each day, with a maximum of 40 hours each week.

Transportation:

Transportation was effected mainly by trucks. Equipment and provisions were transported from the forest headquarters at Conora, a distance of about 60 miles. Transportation of the men to and from work was by truck when the distance was greater than one mile.

Control Methods Used:

Spotting: This was done by running traverse strips of 10

chains width, on compass line, across each section. In this way each section was completely covered by 8 traverse lines. The compassman kept the course, pacing the distance, mapped the topography and location of spotted trees, and kept the spotting record. Two spotters covered the wing strips and the third spotter the swing strip. The spotters blazed each infested tree on 3 or 4 sides, gave each a serial number (supplied by the compassman) with lumber crayon, wrote the tree data card and attached it to the tree.

Treating: The head faller in each treating crew located the trees marked for treatment by reference to treating maps supplied by the spotting crew. Each treating crew was daily assigned definite areas, or series of tree numbers, by the camp foreman. After felling the trees, limbs were loppedoff and the bark removed from both sides and the top of the bole. Fire lines were constructed encircling the prepared log and the entire mass fired. This peeling and burning method was followed in treating each tree regardless of tree species or species of insects involved. Treatment of each tree was timed by the head faller and this treating time, together with other pertinent data, entered upon the back of the tree record cards which were daily turned in to the camp foreman.

Period of Operations:

Control work on this project included two separate periods of field operations. The first period extended from November 6 to December 15, 1933. The second period begun February 19, and was completed April 12, 1934.

Area Treated:

The area covered by control work comprised slightly over 41 sections or about 27,000 acres. That section of the area, as originally set up, lying south of the South Fork in Township 18, R 18 E was later included in the Buck Meadows C.C.C. project.

Amount of Infestation Treated:

The total amount of infestation treated in terms of number of trees and concurrent volume, is 1,811 trees and 2,774,870 board feet content.

Species and Volume Treated:

Tree Species	Number of Trees	Volume B.F.	Ave.Volume
Ponderosa pine	1,004	1,829,560	1,141
Sugar pine	807	945,310	4,567
Totals	1,811	2,774,870	
Average per acre	.07	103	

The total ponderosa pine treated includes 87 trees, with a vol-

ume of 27,370 board feet, which were felled along the Hetch-Hetchy road in the fall of 1933 by CCC crews. These trees were felled in roadside cleanup operations and were green when cut. They were later infested by either the western pine beetle, the mountain pine beetle, species of Ips, flathead barkborers, the red turpentine beetle, or a combination of one or more of these species. The broods in these trees were well developed during the spring operations and they were treated along with adjacent infested standing trees.

Production Summary:

Acreage treated	27,000 acres
Trees treated	1,811 trees
Volume treated	2,774,370 B.F.
Total Man days	3,515
Acres spotted per day	225 acres
Trees spotted per day	15 trees
Average Volume per tree treated	1,643 B.F.

Distribution of Man Days:

Spotting	424	days
Treating	2,448	days
Overhead (cooks, flunkies, saw-filers, trucking, etc.)	563	days
Contributed: J. E. Patterson S. E. Parsons	80	days
Total	3,515	days
Trees spotted per man day	4.27	
Volume spotted per man day	6,545	B.F.
Trees treated per man day	.74	
Volume treated per man day	1,133	B.F.

TOTAL COST OF PROJECT

The total cost of operation was $25,311.50. This sum represents net payroll, including salary of supervising head, mess cost, gasoline, oil and maintenance of trucks, and rental of camp quarters. Overhead cost, or capital outlay, such as trucks, tools, camp equipment and miscellaneous non-expendable articles, chargeable to the

project on a rental basis have been prorated on four months' usage; or as 1/3 of original cost.

Distribution of Cost:

Payroll	$ 19,161.33
Provisions (Mess)	2,487.06
Supplies (Gas, Oil, misc.) .	854.61
Rental of Equipment	608.50
Rental of Camps	200.00
Total	$ 23,311.50

Unit Cost:

Cost per tree treated.	$ 12.87
Cost per MBM treated	8.40
Cost per man day.	6.65
Meals served - - -	11,641 -
Cost of meals served . . . . . (Cook's and flunky's wages included)	$ 3,589.19
Cost per meal.	.31
Revenue from meals served. . .	2,910.75
Revenue per meal	.25
Loss on meals served	678.44
Loss per meal served	.06
Loss per man day on meals. . .	0.165

ANALYSIS OF INFESTATION, CONTROL AND COSTS

Infestation:

By far the greatest infestation on this project, in terms of trees and volume consisted of broods of the western pine beetle in ponderosa pine. Next in order of importance and quantity was the mountain pine beetle in sugar pine. Flatheaded barkborers and Ips spp. were common in both pines and were the primary insects in infesting an appreciable number of trees. All these species were found alone in individual trees though the usual infesting broods were made up of a combination of two or more of these species in association. The red turpentine beetle was present in the basal sections of the majority of both species of pines treated.

The infestation of the western pine beetle in ponderosa pine during the season immediately preceding control operations was in a subsiding condition though still aggressive. The peak of the epidemic had been reached in 1932. The infestation in 1933 was approximately 70% of that of the previous year. In infestations of the mountain pine beetle in sugar pine the trend was different. While the 1932 loss was approximately three times that for 1931, the 1933 loss was only slightly less than that of 1932. The prevalence of flatheaded barkborers, Melanophila spp., was a characteristic of the

infestation in both pines, and to an appreciable extent these beetles were the primary attacking species.

Spotting:

The acreage covered per day and number of trees worked were in direct relation to topography and intensity of infestation. The more rugged the topography and scattered infestation, the less acreage covered and fewer trees worked per day. The average daily production throughout the operation amounted to 225 acres and 15 trees. Because of the extremely rough terrain of the area and the medium infestation, the production by the spotters is considered very good. The total number of days charged to spotting includes time contributed to spotting trees for oil treatment experiments and examinations of these trees after treatment.

Very intensive coverage of the ground was necessary because of the retarded fading of infested trees. A very low percent of attacked trees on this project faded to the extent of easy determination during the period of operations. This lack of color change in the foliage was an adverse factor of importance in spotting. It was not possible to spot trees by color alone, making it necessary for the spotters to examine each tree at close range. The causative factor for so large percent of attacked trees retaining the normal green color of the foliage over such an abnormally long period, was investigated. It was determined that the principal cause was absence of infestation of the limbs and twigs. Normally, the limbs and twigs of infested trees are heavily attacked by Ips spp., and Pityophthorus spp. The absence of attack by these beetles was a remarkable feature of the infestation, and consequently the limbs and twigs of brood trees remained green for long after the primary insects had caused the dying and drying out of the trunks.

Treating:

All trees were felled, limbed, completely peeled, and all bark burned. This procedure was followed even with trees of partial green butts, so that no parts of treated trees could harbor re-infestations.

Marking, and subsequent treatments, of all top-killed trees which contained even a partial brood of barkbeetles, assured a thorough cleanup of the infestation. However, all top-killed trees that were not infested at time of spotting, and which it was thought had an even chance of recovery, were not treated. The control of this project was as intensive and thorough as is practicably possible with present control methods and without prohibitive cost.

The cost of treating the infested trees is high. This high unit cost was partially due to late fall and early spring work when bark of infested trees is tight and difficult to peel and to scattered brood trees, and heavy brush cover, which slowed up the crews and diverted time from actual treating work. Another adverse factor during the spring period was the high fire hazard necessitating more adequate fire lines and requiring long attendance by at least one man at each

tree treated. This was a precautionary measure that fully repaid the additional cost in preventing control fires spreading with consequent damage and cost of suppression. However, the high control cost is due in the larger measure to the high wage scale paid under the NIRA Code. It will be noted that the cost per man day was $6.63; a large increase over any previous control projects. The production per man day was .75 [redacted] tree, and 1,133 board feet. However, the total man days charged to treating includes time spent in erection of camps, building of tent frames and moving camps and equipment. Other extraneous time charged to production included labor of felling and oiling infested trees utilized in a practical application of certain penetrating oils. Excluding the time spent on these operations would materially raise the man day production above the figure stated, which would then compare very favorably with other projects previously carried out in this region.

FUTURE RECOMMENDATIONS

Inasmuch as this project is not completely isolated from surrounding infestations, which are now in an aggressive state, it is recommended that close watch be kept of early developments on the project area, and also on surrounding infested areas. In order to assure this detection surveys should be made of all these areas following development of the first seasonal broods in the summer of 1934. The areas of direct influence are portions of the Buck Meadows area and areas across the Tuolumne Canyon in the Jawbone-North Mountain region. It is expected that these areas will develop epidemic infestations during 1934. Another epidemic area of more remote situation is in Anderson Valley. This area should also be kept under surveillance. It is usual for some re-infestation to appear on control areas following first treatment. Re-working the project area in the fall of 1934, or spring of 1935, will depend upon the amount of re-infestation which develops during the season of 1934. A survey in the early fall should determine the feasibility of control work at that time. It is recommended that such a survey be made.

John E. Patterson
Foreman, Insect Control.

Binding Edge

Ponderosa pine infested with the western pine beetle. Showing the progressive fading of the foliage characteristic of infested trees during the spring period. March 1934. The needles of the lower limbs have just recently faded to a light yellowish-green color. Those of the midsection have changed to yellow, while the crown had developed the characteristic sorrel. JEP.

OPERATIONS IN THE TREATMENT OF A PONDEROSA PINE TREE INFESTED WITH THE WESTERN PINE BEETLE, DENDROCTONUS BREVICOMIS, Lec.

Photographs made on the Stanislaus - Tuolumne NIRA control project.

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The first operation: Falling: At left; putting in the back kerf. After the tree is lined with the undercut (on opposite side) the fallers finish the operation in the manner shown. At right: The tree falling. JEP.

A peeled ponderosa pine log showing galleries of the western pine beetle. Camp Foreman, Vance Brown inspecting the job. JEP.

The second operation: Upper: Limbing and peeling. After the tree is felled the limbs are cut off and the infested bark of the trunk is removed with axes or "spuds". Two men are shown limbing and one man is peeling the infested bark. Note that only the upper part of the stump is peeled. The bark around the collar of the stump is not removed or burned because predacious beetles (Clerids) that destroy the tree killing species largely pupate and hibernate in the lower stump. Treating this bark would kill these beneficial insects. Lower: After the tree is limbed and peeled the infested bark and small limbs are raked to the sides of the log, and a fire trail is made around it, preparatory to burning. JEP.

The third operation: Burning: Upper picture shows the burning of the infested bark. Fires are started along each side of the peeled log.
Lower: The final operation. After the log is burned it is inspected for thoroughness of treatment and any hang-over fires are put out. Note that the stump is not burned; a protective measure for the beneficial insects. The mass of soil at point of arrow was placed at end of log to prevent the control fire reaching the stump. A portion of the fire trail is shown at the

Bimetling Edge

UPPER - North slope of Sawmill Mountain. Mixed stand of ponderosa pine and sugar pine typical of north and west exposures on the project area. JEP.
LOWER - Pure stand of ponderosa pine on edge of Ackerson Meadow showing top-killed trees and trees killed by the western pine beetle in previous infestations. JEP.

STANISLAUS - TUOLUMNE

1933-1934 INSECT CONTROL PROJECT

NIRA PROJECT

• TREATED TREES

R.18 E.

R.19E.

R.20E.

T. 1 S.

T. 2 S.

STANISLAUS NIRA AREA

CO-OP

NATIONAL PARK AREA

COOPERATIVE AREA

NATIONAL PARK AREA

BUCK MEADOWS ECW PROJECT

WORKED BY NPS

YOSEMITE NATIONAL PARK

STANISLAUS NATIONAL FOREST

Tuolumne River

Middle Fork

South Fork

North Fk.

Merced R.

Drew Cr.

Big Creek

Hazel Green Cr.

North Crane Cr.

Moss Creek

Little Crane Creek

Bull Creek

Porath Gulch

Deer Gulch

Montgomery Flat Cr.

Big Grizzly

Y.L. CO. R.R.

R.R.

HETCH HETCHY

HOG RANCH R.S.

MATHER

DIAMOND "O" CAMP

BEAR MTN.

ASCENSION MTN.

ACKERSON MTN.

ACKERSON MDW.

SAWMILL MTN.

OAKLAND CAMP

SOUTH FORK CAMP

BERKELEY CAMP.

CARL INN

ASPEN VALLEY R.S.

CROCKER RIDGE

LITTLE PILOT

HODGDON RANCH

TUOLUMNE R.S.

TUOLUMNE GROVE BIGTREES

GIN FLAT

CRANE FLAT R.S.

HAZEL GREEN

CAMP 17

PILOT PK. L.O.

MAILBOX R.S.

BOAT CAMP

BOWER CAVE

MCCAULEY RANCH

ANDERSON FLAT

DOMINGO FLAT

BIG GRIZZLY FLAT

BULL CR. SCHOOL

MERCED GROVE R.S.

MERCED GROVE BIGTREES

INCLINE

R.C.J. 4-34

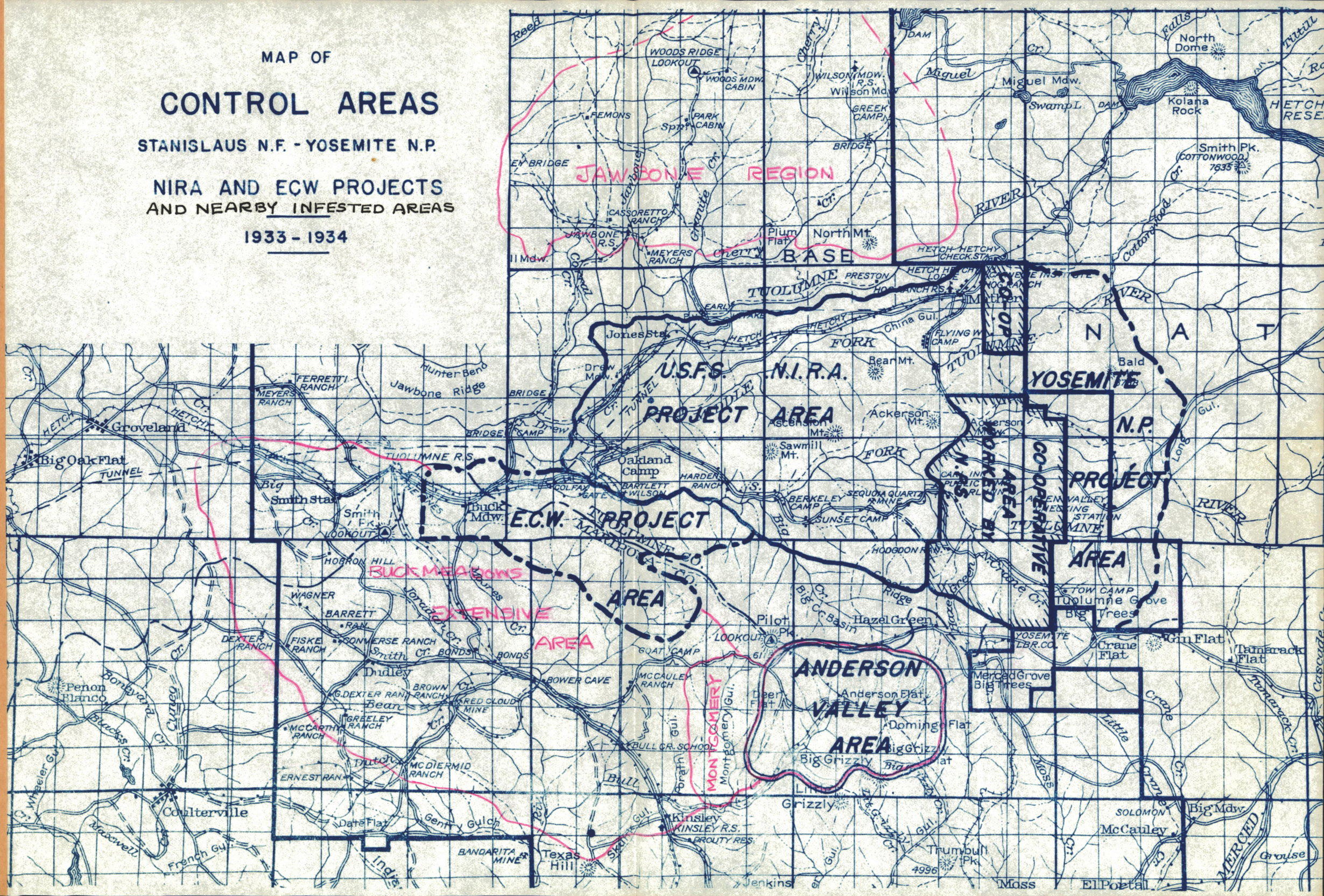
MAP OF

CONTROL AREAS

STANISLAUS N.F. - YOSEMITE N.P.

NIRA AND ECW PROJECTS
AND NEARBY INFESTED AREAS

1933 - 1934


JAWBONE REGION
BUCK MEADOWS EXTENSIVE AREA
U.S.F.S. N.I.R.A. PROJECT AREA
E.C.W. PROJECT
TUOLUMNE CO. MARIPOSA CO. AREA
ANDERSON VALLEY AREA
CO-OPERATIVE PROJECT AREA
YOSEMITE N.P.
BASE
Groveland
Big Oak Flat
Coulterville
Jamestown
Sonora
Chinese Camp
Jacksonville
Moccasin
Hetch Hetchy
Yosemite
Wawona
Merced
El Portal
Woods Ridge Lookout
Smith Pk. Lookout
Pilot Pk. Lookout
Kinsley
Texas Hill
Oakland Camp
Buck Mdw.
Big Smith Stan
Jones Sta.
Drew Mdw.
Ferretti Ranch
Meyers Ranch
Cassoretto Ranch
Jawbone R.S.
Wilson Mdw. R.S.
Wilson Mdw.
Greek Camp
Plum Flat
North Mt.
Preston
Hetch Hetchy Lodge
Hetch Hetchy Check Sta.
Hetch Hetchy Ranch R.S.
Early Intake
China Gul.
Flying W Camp
Bear Mt.
Ackerson Mt.
Ackerson Mdw.
Sawmill Mt.
Berkeley Camp
Sequoia Quartz Mine
Sunset Camp
Hodgdon Ranch
Tow Camp
Tuolumne Grove Big Trees
Yosemite Lbr. Co.
Crane Flat
Gin Flat
Tamarack Flat
Merced Grove Big Trees
Deer Flat
Anderson Flat
Domingo Flat
Big Grizzly
Little Grizzly
Trumbull Pk.
4996
Pilot Pk.
6115
Hazel Green
Big Cr. Basin
Ridge
Hunter Bend
Jawbone Ridge
Tuolumne R.S.
Colfax Gate
Bartlett & Wilson
Harden Ranch
Big Oak Flat Tunnel
Hetch Hetchy Tunnel
Hetch Hetchy Aqueduct
Hetch Hetchy Reservoir
Miguel Mdw.
Swamp L.
Kolana Rock
North Dome
Smith Pk. (Cottonwood) 7635
Cottonwood Cr.
Falls Cr.
Tuttul Cr.
Miguel Dam
Wilson Mdw. Dam
Hetch Hetchy Dam
Tuolumne River
Merced River
Clavey Cr.
Cherry Cr.
Granite Cr.
Jawbone Cr.
Reed Cr.
Bonds Cr.
Smith Cr.
Brown Cr.
Bower Cave
Red Cloud Mine
Bandarita Mine
Bull Cr. School
Prouty Res.
Kinsley R.S.
Jones Sta.
Drew Camp
Tunnel
Bridge
Ferretti Ranch
Meyers Ranch
Cassoretto Ranch
Jawbone R.S.
Converse Ranch
Fiske Ranch
Dexter Ranch
G. Dexter Ranch
Barrett Ranch
Wagner
Hobron Hill
Moores
Jordan Cr.
Goat Camp
McCauley Ranch
Greeley Ranch
McCarthy Ranch
Ernest Ranch
McDiermid Ranch
Dudley
Penon Blanco
Bonds
Bucks Cr.
Curtis Cr.
Bonbyara Cr.
Wheeler Gul.
Maxwell
French Gul.
Date Flat
Gentry Gulch
Indian
Bull
Dorath Gul.
Montgomery Gul.
Skull Gul.
Jenkins
Moss
Solomon
McCauley
Big Mdw.
Grouse
Long
Cascade
Little Crane Cr.
Crane Cr.
Tamarack Cr.
Big Cr.
Green
Ackerson Cr.
Gul.
Yosemite Valley Electric Station
Yosemite Valley R.R.
Yosemite Valley Electric R.R.
Yosemite Valley Public Service R.R.
Yosemite Valley Power Line
Yosemite Valley Telephone Line
Yosemite Valley Telegraph Line
Yosemite Valley Electric Line
Yosemite Valley Public Service Line

EXTRA PHOTOGRAPHS INCLUDED IN
AUTHORS COPY OF THE REPORT

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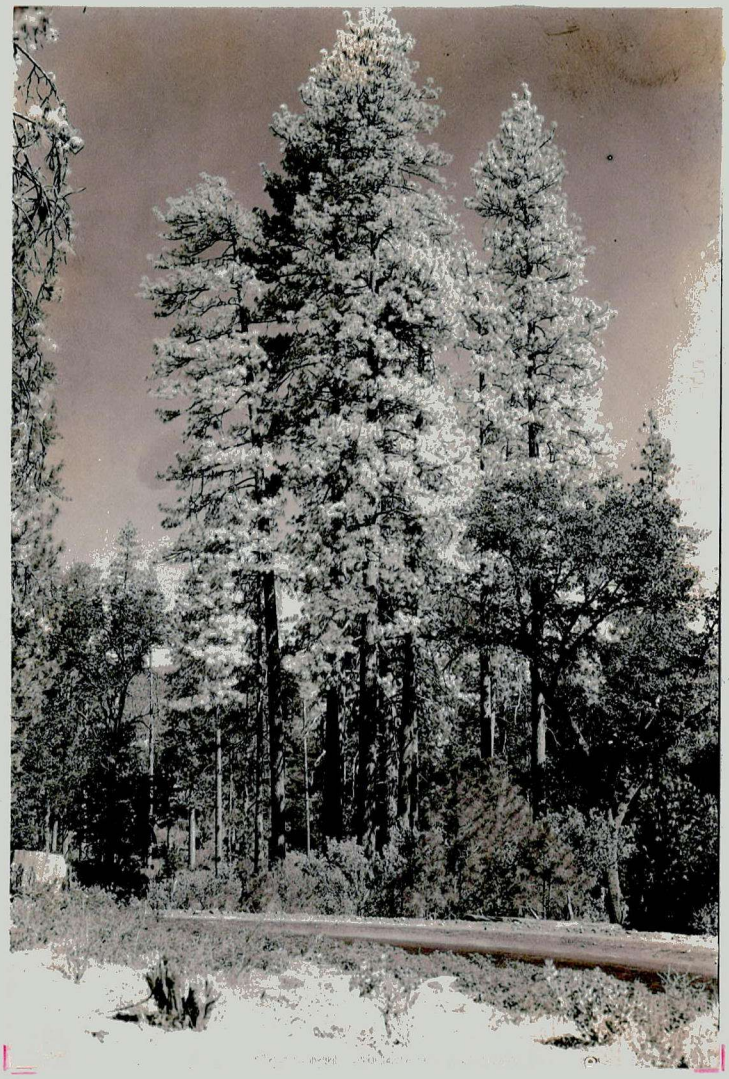
These photographs were made on the project area during the period of control operations and are includede in this appendix as a measure of completeness and for personal reference.



A - Group of beetle killed ponderosa pine trees near South Fork. These trees were attaked by the western pine beetle in late April and in May 1933. The broods emerged in July and August. The photograph was made in August. At that time the foliage was sorrel to red. Original J.E.P.

A

B &C: Left: Spike top trees in Ackerson Meadow. Result of previous top infestations by engraver beetles, Ips spp. Many such trees of recent attack occurred on the area, and a high percentage of them were later attacked and killed by the western pine beetle. Only those that showed no signs of recovery were treated. The white snag in the foreground was killed several years previous by the western pine beetle. Right: A ponderosa pine tree at Ackerson Meadow which had been struck several years ago by lightning which knocked its top out. The scar of the grounded bolt shows as a white strip on the lower trunk. Usually trees damaged in this way are subsequently attacked by beetles. However, this one escaped attack.

BC

D - Falling an infested ponderosa pine tree for treatment. This tree contained a brood of the western pine beetle. Original J.E.P.

D

E - A large ponderosa pine tree treated at Ackerson Meadow. This tree was 82 inch. in diameter at BH. for 10 logs, and contained 18,380 board feet of lumber. It was infested by the western pine beetle and the Oregon engraver beetle. The tree contained shake and fungus rot in the heartwood. Note how the control fires gutted the basal section. Original J.E.P.

E